SUPPORT FOR THE AMENDMENT

This Amendment amends Claim 1. Support for the amendments is found in the specification and claims as originally filed. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 1-6, 8-10 and 15-18 will be pending in this application. Claim 1 is independent.

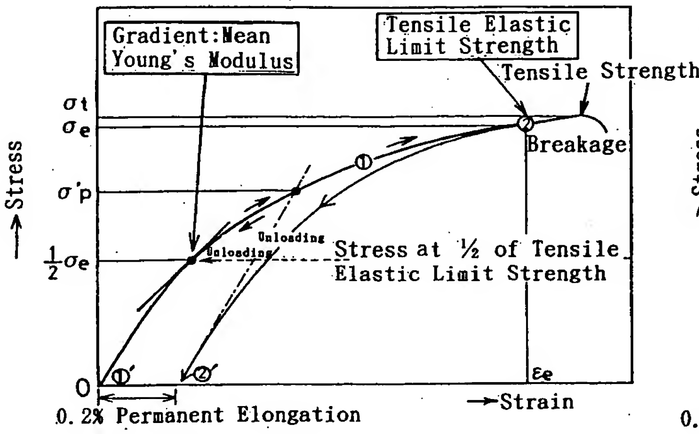
REQUEST FOR RECONSIDERATION

Applicants respectfully request entry of the foregoing and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

Applicants thank the Examiner for the indication that pending Claims 5, 8-10 and 16-18 would be allowable if rewritten if independent form including all of the limitations of the base claim and any intervening claims. Office Action at page 7, section 7. However, for the reasons discussed below, Applicants respectfully submit that all of the pending claims are allowable.

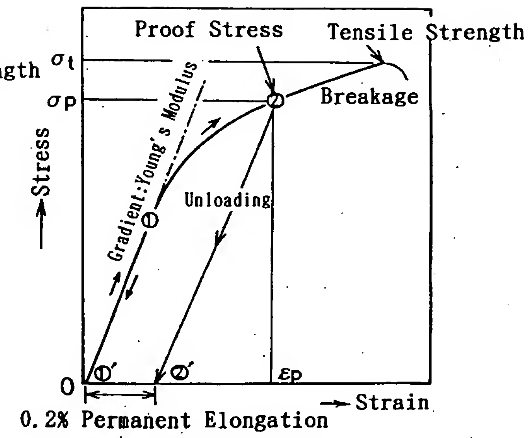
The present invention provides a titanium alloy member with superior cold working properties, a low Young's modulus and high strength. The titanium alloy of the present invention includes an unprecedented large amount of O, N or C, is remarkably tough and shows a high elastic deformation capability. As a result of the present invention, the necessity for strictly controlling the oxygen content in titanium alloys has been obviated. Specification at page 14, lines 7-9. Qualitative differences in the stress-strain curve of the titanium alloy member of the present invention and the stress-strain curve of conventional titanium alloy are shown in the specification at Figs. 14A and 14B, which are reproduced below.

FIG. 14A



Titanium Alloy of Present Invention

FIG. 14B



Conventional Titanium Alloy

While conventional titanium alloys are characterized by a tensile strength, σt, the titanium alloy member of the present invention is characterized by a "tensile elastic limit strength", σe, which is less than σt.

In contrast to conventional titanium alloy, the titanium alloy member of the present invention has a stress-strain curve that is not linear in the low stress, elastic deformation range, but instead has a gradient (i.e., slope) that continuously decreases along the stress-strain curve with increasing stress. See specification at [0099] to [0116].

The non-linear stress-strain characteristics of the titanium alloy member of the present invention are achieved by controlling the alloy composition and by cold-working the alloy. The alloy can be manufactured by sintering or melting, provided that the alloy is finally cold-worked. The cold-working of the titanium alloy composition results in a material that undergoes plastic deformation via a mechanism that is quite different than the mechanism of conventional titanium alloys. Conventional titanium alloys undergo plastic deformation by gliding deformation or twinning by dislocation. In contrast, the titanium alloy member of the present invention appears to undergo plastic deformation by the curving of crystal planes,

without introducing dislocations. See, e.g, specification at [0021-[0024], [0069]-[0073], [0114-0115] and [0164-0170].

As shown in the attached Declaration Under 37 C.F.R. § 1.132, cold-working promotes the appearance of non-linear stress-strain properties at low stress in the titanium alloy member of the present invention.

Claims 1-3 are rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 5,871,595 ("Ahmed") alone or further in view of A Dictionary of Metallurgy. Claims 4, 6 and 15 are rejected under 35 U.S.C. § 103(a) over Ahmed alone or further in view of A Dictionary of Metallurgy.

Ahmed discloses a biocompatible titanium base alloy for medical devices. Ahmed discloses:

> Tables 1 and 2 describe alloys of the present invention prepared from pure elemental metals which were melted in either an arc or plasma furnace to form the desired composition. The resulting ingot may be forged or machined to the shape of the device in which the alloy is to be used. Solution heat treatment to ensure an all β structure, or a combination of heat treatment and/or working may be employed to produce an α-β alloy if such is desired. Ahmed at column 4, lines 56-63.

However, Ahmed is silent about cold-working the titanium alloy. The Office Action admits that "Ahmed does not specifically teach cold working the titanium alloy". Office Action at page 4, lines 15. The Office Action cites A Dictionary of Metallurgy for indicating "that the definition of working includes cold working". Office Action at page 4, lines 11-12.

However, "working" a titanium alloy is not sufficient to achieve the non-linear characteristics of the present invention; the "working" must be cold-working. If working is carried out when an alloy is hot the strain producing the non-linear characteristics of the present invention is not introduced into the alloy. Furthermore, if the alloy is heated after cold-working, the strain producing the non-linear characteristics of the present invention is

released from the alloy. Cold-working is necessary to introduce into an alloy the strain that manifests itself in the non-linear characteristics of the present invention.

The attached Declaration Under 37 C.F.R. § 1.132 shows that a sample corresponding to the TA22 sample of Ahmed, after being cast and hot forged, but not cold-worked, does not exhibit the non-linear stress-strain characteristics at low stress of the titanium alloy member of the present invention.

There is no suggestion in the cited prior art that non-linear stress-strain characteristics at low stress can be achieved in a titanium alloy. Furthermore, there is no recognition in the cited prior art that cold-working is important for achieving these non-linear characteristics.

Thus, there is no reasonable expectation that the cited prior art would have successfully led the skilled artisan to the present invention.

Because the cited prior art fails to suggest the titanium alloy member of independent Claim 1 having the structural features implied by the "cold-working" limitation, or the resulting characteristic of a "tensile deformation property such that a gradient of the tangential line in a stress-strain diagram obtained by a tensile test within an elastic deformation range, in which the stress ranges from 0 to the tensile elastic limit strength, decreases continuously with increase in stress", and because there is no reasonable expectation of success, the prior art rejections should be withdrawn.

Claims 1-3 are rejected under 35 U.S.C. 112, second paragraph. To obviate the rejection in Claim 1 "the titanium alloy member is subjected to cold-working" is replaced with --the titanium alloy member is in a cold-worked condition--.

In view of the foregoing amendment and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

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Attached: Declaration Under 37 C.F.R. § 1.132

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